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SOME PLANTS OF MOUNT MCKINLEY NATIONAL PARK, MCGONAGALL MOUNTAIN AREA

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DURING a Harvard Mountaineering Club expedition into the Alaska Range during the summer of 1952, Thayer Scudder and the author were able to make the collection of plants considered in this paper. Botanizing had to be interspersed with a program of surveying, testing of equipment and various other activities. However, it was possible to collect at various times over a period of 26 days which represents half of the very brief growing season characteristic of relatively high altitudes in the Alaska Range.

An attempt was made to collect, as thoroughly as possible, the vascular plants at three different altitudes on McGonagall Mountain, which is one of the foothills to the north of Mt. McKinley and just north of the Muldrow Glacier. The first collecting locality was in the valley of Cache Creek from the junction of Cache and Oastler Creeks, at an altitude of 3750 feet, to the point at which the Cache Creek valley closes in to become a canyon, at an altitude of 4350 feet; plants were collected here on June 29th (nos. 1-14), July 25th (nos. 57-65) and July 26th (nos. 70-96). The second locality was at McGonagall Pass, at the head of the Cache Creek valley, and overlooking the Muldrow Glacier, at an altitude of 5700 feet; plants were collected here on July 4th (nos. 15-46), July 17th (nos. 47 and 50-56) and July 26th (nos. 200-205c). The third locality was on or near the summit ridge of McGonagall Mountain, at an altitude of 6550 feet; plants were collected here on July 26th (nos. 206-219). The last mentioned collection came from the highest altitude at which vegetation was seen during the trip, with the exception of scattered rare plants of *Saxifraga oppositifolia* seen above 7000

feet on Mt. Brooks, seven miles southeast and across the Muldrow Glacier. All three collecting areas were well above timberline, which is at about 2900 feet. Collections were also made on July 17 (nos. 48 and 49) and July 20 (nos. 66–69) of the few plants which were found on the barren lateral moraine at the base of Mt. Brooks.

McGonagall Mountain is a portion of a granitic batholith 2 to 4 miles wide and about 20 miles long with its long axis oriented on an east–west line (Bradford Washburn, 1953).¹ It is bordered by the Muldrow Glacier which parallels it on the south. Across the Muldrow are the major peaks of the McKinley batholith itself, plus Mt. Brooks, Mt. Wedge, Mt. Mather and others. The bedrock of McGonagall Mountain is a granodiorite, and is thought to be of late Jurassic age. The entire region was heavily glaciated in relatively recent times, as is shown by the presence of two large terminal moraines at the mouth of the Cache Creek valley. Furthermore, the surface of the Muldrow Glacier is only 50 feet below McGonagall Pass, and it undoubtedly spilled over the pass and down into the valley during the Pleistocene, and probably more recently.

Frost action is severe at all three localities, as is well shown by the presence of sorted circles and terracettes, particularly at the pass, and larger solifluction forms on the valley slopes and meadows. Sorted circles are the result of freezing and thawing on level ground, while terracettes plus larger solifluction phenomena result from the mass movement of soil materials down slopes as a result of freezing and thawing, with an accumulation of coarser gravel and boulders on the lower margins of the sagging areas in many cases (A. L. Washburn, 1950). Rainfall data are not available, but the total precipitation must be fairly high. During the group's stay in the area, rain fell on 27 out of 35 days, and snow fell on one occasion.

On McGonagall summit, the soil is extremely gravelly, with virtually no accumulation of humus. Snow, rain and ground frost melt-water keep the ground saturated most of the time. Only 14 species of vascular plants were found capable of surviving the extremes of temperature and exposure to wind occurring at that altitude. The actual summit ridge was bare of all vegeta-

¹ Oral communication.

tion, and what plants were found grew in the little shelter offered by the boulders on the slopes below the ridge. Individual plants were widely scattered, and from a distance there appeared to be no vegetation at all. Five of the 14 species are ones with a campion or pincushion habit, and one, *Saussurea viscida*, normally over a foot in height, was reduced to a few inches. Of the species collected, one, *Saussurea viscida*, was not found below the summit; three, *Polemonium boreale*, *Saxifraga oppositifolia* and *Saxifraga serpyllifolia* were found in the pass, but not in the valley; and the remaining ten were found in the valley and the pass (with the exception of *Campanula lasiocarpa*, which was collected in the valley, but not in the pass).

At the pass, there was a greater accumulation of fine gravel than on the summit, and on the surface of the terracettes on either side of the pass, thin patches of humus sometimes accumulated. As on the summit, the commonest species were those with a campion habit, and individual plants were widely scattered. Most of the area was bare gravel strewn with boulders, but on July 17, it resembled a well kept rock garden. On the surface of the terracettes, *Draba densifolia*, *Polemonium boreale* and *Synthyris borealis* were common, and on the more level gravel, *Saxifraga oppositifolia*, *Saxifraga lyallii*, *Saxifraga serpyllifolia* and *Silene acaulis* were prominent. *Papaver radicum* was slightly less common. In the wettest gravel were found *Smelowskia borealis* var. *Koliana*, *Minuartia macrocarpa* and *Luzula confusa*. Forty-two species, 25 of which were not found in the valley below, were collected.

A much greater diversity of habitat types existed in the valley. In the creek bed, most of which is exposed except during the earliest part of the growing season, the gravel was largely bare. However, patches of *Arnica louiseana*, *Luzula confusa* and *Epilobium latifolium* were prominent on small humus covered areas. On either side of the creek were broad sloping meadows on which there was an uneven layer of humus and *Sphagnum* which reached a foot in thickness in some places. As on the summit and at the pass, the subsoil was kept saturated with moisture most of the time, but on slopes with good drainage, the surface layer could become fairly dry. Except where occasional boulders protruded, the vegetation cover was complete. In localized areas on the

order of a few square yards in size, the vascular plant cover often consisted of a single species only. Plants which normally occurred in such patches were *Cassiope tetragona*, *Loiseleuria procumbens*, *Anemone narcissiflora*, *Geum rossii* and *Dryas octopetala*. Among the cobbles in the habitats at the lower margins of the solifluction forms where there is a lot of moisture, but little fine grained material and frost heaving, were found almost exclusively *Therefon richardsonii* and to a lesser extent *Minuartia macrocarpa*. The former is a tall herb with large dark green leaves which make it prominent and enable one to identify the lower margins of the frost formations mentioned above from over a half-mile away. In very wet depressions where drainage was poor, *Sedum rosea*, *Claytonia sarmentosa*, *Polygonum bistorta*, subsp. *plumosum* and *Therefon richardsonii* were important elements. Species with a campion habit were relatively rare, and occurred primarily in disturbed situations such as the banks of gullies where little humus could accumulate. Of the campion plants found at the pass, only *Silene acaulis* and *Minuartia macrocarpa* occurred in the valley, but *Loiseleuria procumbens*, not found in the pass, also showed this habit. Of the 47 species collected in the valley, 31 were not found in the pass or above.

In the following list of vascular plants, the letter S after a species-name indicates that it was collected on the summit of McGonagall Mountain; the letter P, in the pass; the letter V, in the valley; and the letter M, on the lateral moraines below Mt. Brooks.

LIST OF VASCULAR PLANTS

HIEROCHLOË ALPINA (Sw.) Roem. and Schult., V, no. 91, dry meadows and slopes; P, no. 28.

ARCTAGROSTIS LATIFOLIA (R.Br.) Griseb., V, no. 89, exposed gravel of stream bed, uncommon.

TRisetum SPICATUM (L.) Richt., V, no. 86; P, no. 204, wet gravel.

POA ARCTICA R. Br. V, no. 96; P, no. 205a; S, no. 218; very wet gravel. New to Alaska Range.

POA GLAUCA Vahl, P, no. 205b.

FESTUCA ALTAICA Trin. V, no. 61.

CAREX MICROCHAETA Holm, V, no. 85; P, no. 27; S, no. 211; common in drier gravel where humus is absent.

Porsild's treatment (1951) is followed in placing these specimens under *C. microchaeta* Holm. The culms are phyllopodic, by which character the material is distinguished from *C. podocarpa* R. Br., in which the culms

are aphyllopodic. If one chooses to recognize *C. nesophila* Holm as a species distinct from *C. microchaeta*, the material clearly belongs to the latter species, lacking fibrillose leaves along the rhizome, and possessing strongly exserted styles. The presence or absence of teeth on the mouth of the beak of the perigynium is not a good character, since a full range of variation may be found on a single plant. See Porsild's paper for a fuller discussion of the above species.

LUZULA CONFUSA Lindb., V, no. 83; P, no. 39; S, no. 210; dry gravel, very common at all three altitudes.

TOFIELDIA COCCINEA Rich., V, no. 95, dry meadow where humus was thin.

LLOYDIA SEROTINA (L.) Reichenb., V, no. 12; P, no. 15; dry meadows and terracettes.

SALIX ALEXENSIS Cov., V, no. 58, gravel of stream bed. This collection was taken at the highest altitude at which a shrubby willow was observed.

SALIX ARCTICA Pallas, V, no. 6, sloping meadows.

This material resembles *S. arctica* Pallas, with the exceptions that it has styles over 2 mm. long, and occasional although very reduced stipules. These two characters are suggestive of *S. crassijulis* Trautv., a species from south of the Alaska Range, the Bering Sea Coast, and the Aleutian Islands. I am in agreement with Hultén that these two species and *S. torulosa* Trautv. are very possibly subspecies of the same species.

SALIX PHLEBOPHYLLA Anderss., P, no. 43b.

SALIX RETICULATA L., P, no. 205c.

SALIX ROTUNDIFOLIA Trautv., P, nos. 41 and 43a.

No. 41 represents typical *S. rotundifolia* as it occurs in the area. No. 43a, although having the short catkins and glabrous capsules of *S. rotundifolia*, has the larger and more ovate leaves of *S. phlebophylla*. No. 43b, furthermore, has leaves which closely match those of 43a, but its catkins are longer and its capsules are pubescent in many cases; it resembles *S. phlebophylla*, but with a slight variation in the direction of *S. rotundifolia*. It seems possible, on the basis of these facts, that a certain amount of introgression has taken place between these two species, particularly since all three collections were made from McGonagall Pass, from fairly fine gravel, within an area of about 100 square feet.

OXYRIA DIGYNA (L.) Hill, V, no. 57, wet gravel of stream bed.

POLYGONUM BISTORTA L., subsp. *PLUMOSUM* (Small) Hult., V, no. 65, wet depressions.

POLYGONUM VIVIPARUM L., V, no. 79, wet meadows, on thin humus.

CLAYTONIA SARMENTOSA C. A. Mey., V, no. 72, margins of wet depressions.

CLAYTONIA SCAMMANIANA Hult., P, no. 26.

STELLARIA CRASSIFOLIA Ehrh., V, no. 73, wet meadows.

STELLARIA LONGIPES Goldie, var. *EDWARDSII* Kurtz., P, no. 19.

MINUARTIA MACROCARPA (Pursh) Ostenf., V, no. 87; P, no. 21; S, no. 216; wet gravel, scree slopes, and lower margins of solifluction formations.

SILENE ACAULIS L., V, nos. 7 and 90; P, no. 6; S, no. 215; moist meadows and terracettes.

MELANDRIUM FURCATUM (Raf.) Hult., M, no. 67.

ANEMONE NARCISSIFLORA L., subsp. INTERIOR Hult., V, no. 92, dry sloping meadows.

RANUNCULUS NIVALIS L., M, nos. 49 and 66.

PAPAVER RADICATUM Rottb., V, no. 5; P, no. 29; S, no. 213; dry hillsides and gravel, commoner at higher altitudes.

CARDAMINE BELLIDIFOLIA L., P, nos. 44 and 52.

DRABA ALPINA L., V, no. 4; P, nos. 46 and 47; dry gravel and moraine.

DRABA DENSIFOLIA Nutt., P, no. 17, surface of terracettes, on slight accumulation of humus.

DRABA ESCHSCHOLTZII Pohle, P, nos. 23b, 38 and 51b.

DRABA NIVALIS Lilj., P, no. 51a.

DRABA PSEUDOPILOSA Pohle, P, nos. 23a, and 51c.

The genus *Draba* is very poorly understood in the arctic, and determinations can at best be considered a temporary assignment of names awaiting an exhaustive study of the group. In the material from McGonagall pass, 23a and 51c appear most closely related to *D. pseudopilosa*, a species restricted to northeast Asia, one station on the Bering Sea, and two along the arctic coast of Alaska. These plants have the dense branched pubescence of *D. nivalis*, mixed with simple hairs. The midribs of the leaves, although persistent on the old leaf bases, are not at all prominent on the leaves themselves, a character in which these plants differ conspicuously from *D. nivalis*. The pedicels are pubescent with branched and simple hairs, the siliques are narrower toward the tips, than at the bases, and the styles are very short (less than 0.25 mm. long). The petals are cream colored, and the scapes are long and flexuous. This population is essentially homogeneous. No. 51a matches *D. nivalis*, being fairly typical material, with fine stellate pubescence, reduced styles, and white petals. Nos. 23b, 38, and 51b match Scamman no. 625g from McKinley Park, a plant considered by Hultén to belong closest to *D. eschscholtzii*, which has its type locality in Asia, on the Chukch Peninsula, and has been collected from three widely separated stations along the Yukon River valley. They differ from *D. pseudopilosa* in their emarginate petals; thinner pubescence, of a more strigose character; shorter and stiffly erect scapes; and prominent styles, which are 1 mm. or more in length. All of the above material is separated from the *D. fladnizensis*—*D. lactea* complex by the possession of pubescent scapes and pedicels. All three species occurred in fine wet gravel. *D. pseudopilosa* and *D. eschscholtzii* are both new to McKinley Park.

SMELOWSKIA BOREALIS (Greene) Drury and Rollins, var. *KOLIANA* (Gombocz) Drury and Rollins, P, nos. 22 and 50; extremely wet gravel. These plants are in flower with a few scattered fruits. Their villosity and leaf shape approaches that of var. *villosa*, but flowering material of all varieties is conspicuously more villous than fruiting material. The more mature fruits of these collections are closest to those of var. *koliana*. These plants were collected near the type locality of var. *koliana* and from a site where material clearly belonging to that variety has been collected (Herning, Nelson 1939).

- SEDUM ROSEA* (L.) Scop., V, no. 75; P, no. 40; S, no. 217; moist depressions and wet gravel.
- THEREFON RICHARDSONII* (Hook.) O. Kze., V, no. 70; almost always on the lower banks of solifluction formations, among the coarser gravel and boulders.
- SAXIFRAGA BRONCHIALIS* L., subsp. *FUNSTONII* (Small) Hult., V, no. 62; P, no. 56; wet gravel and scree slopes.
- SAXIFRAGA CAESPITOSA* L., subsp. *SILENIFLORA* (Sternb.) Hult., M, no. 68.
- SAXIFRAGA ESCHSCHOLTZII* Sternb., P, no. 32.
- SAXIFRAGA FLAGELLARIS* Willd., P, no. 45, moist gravel.
- SAXIFRAGA LYALLII* Eng., V, no. 1; P, no. 42; S, no. 219; stream banks and scree slopes.
- SAXIFRAGA OPPOSITIFOLIA* L., P, no. 34; S, no. 209; wet gravel, common.
- SAXIFRAGA RIVULARIS* L., M, no. 69, new to McKinley Park.
- SAXIFRAGA SERPYLLIFOLIA* Pursh, P, no. 25; S, no. 208; wet gravel, common.
- CHRYSOSPLENIUM WRIGHTII* Franch. and Sauv., V, no. 2; P, no. 30; moist depressions.
- PARNASSIA KOTZEBUEI* Cham. and Schlecht., V, no. 74; wet meadow.
- GEUM ROSSII* (R. Br.) Ser., V, nos. 8 and 88; dry meadows, common.
- DRYAS OCTOPETALA* L., V, no. 9; dry meadows, common.
- OXYTROPIS NIGRESCENS* (Pall.) Fisch., subsp. *PYGMAEA* (Pall.) Hult., P, no. 24; moist gravel.
- EPILOBIUM LATIFOLIUM* L., V, no. 60; P, no. 202; stream bed, and dry gravel.
- LIGUSTICUM MUTELLINOIDES* (Crantz) Villar, subsp. *ALPINUM* (Ledeb.) Thellung, V, no. 94; P, nos. 31 and 53; dry tundra, surface of terracettes.
- PYROLA GRANDIFLORA* Rad., V, no. 81, dry meadow.
- LEDUM PALUSTRE* L., subsp. *DECUMBENS* (Ait.) Hult., V, no. 93, dry slope.
- LOISELEURIA PROCUMBENS* (L.) Desv., V, no. 15, dry meadow.
- CASSIOPE TETRAGONA* (L.) D. Don, V, no. 14, dry meadows, very common.
- VACCINIUM VITIS-IDAEA* L., subsp. *MINUS* (Lodd.) Hult., V, no. 82, dry meadows.
- DIAPENSIA LAPPONICA* L., subsp. *OBOVATA* (F. Schmidt) Hult., V, no. 10, dry meadows.
- ANDROSACE CHAMAEJASME* Host., subsp. *LEHMANNIANA* (Spreng.) Hult., P, nos. 37 and 54, wet gravel and scree slope.
- DODECATHEON FRIGIDUM* Cham. and Schlecht., V, no. 71, stream banks and moist slopes.
- GENTIANA GLAUCA* Pall., V, no. 93, dry meadows.
- POLEMONIUM BOREALE* Adams, P, no. 18; S, no. 212; dry slopes and terracettes.
- SYNTHYRIS BOREALIS* Pennell, V, nos. 3 and 11; P, no. 29; S, no. 207.
- CASTILLEJA PALLIDA* (L.) Kunth, subsp. *MEXIAE* Pennell, V, no. 76, dry meadows.
- PEDICULARIS CAPITATA* Adams, V, no. 78, dry meadows.

PEDICULARIS LANATA Cham. and Schlecht., P, nos. 16 and 55.

PEDICULARIS VERTICILLATA L., V, no. 80, wet meadows and depressions.

CAMPANULA LASIOCARPA Cham., V, no. 77; S, no. 214; dry meadows and gravel, uncommon.

ERIGERON ERIOCEPHALUS J. Vahl, M, no. 48.

ERIGERON PURPURATUS Greene, P, no. 201.

ANTENNARIA MONOCEPHALA DC., P, no. 35.

ANTENNARIA PHILONIPHA A. E. Pors., V, no. 64, dry meadows, on thin humus.

ARTEMISIA ARCTICA Less., V, no. 84, wet gravel and thin humus.

ARNICA LOUISEANA Farr., subsp. *FRIGIDA* (Meyer) Maguire, V, no. 59, common, on stream bed gravel, on thin patches of humus.

SAUSSUREA VISCIDA Hult., var. *YUKONENSIS* (Pors.) Hult., S, no. 206.

SENECIO ATROPURPUREUS (Ledeb.) B. Fedtsch., var. *TOMENTOSUS* (Kjellm.) Hult., P, no. 200, wet gravel.

TARAXACUM KAMTCHATICUM Dahlst., P, no. 33, uncommon.

CREPIS NANA Rich., P, no. 203.

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